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SUGAR MAPLE.

Acer saccharum Marsh.

Sugar maple is the most valuable of all maples, native or foreign. It is best known for the sugar and sirup which are made from its sap, but it is also an important timber tree. It is extensively used as a shade tree both in this country and in Europe, and is especially fitted for this use because of its comparative freedom from disease, its thick foliage, and its brilliant color in the fall.

Silviculturally, sugar maple is important because its great tolerance enables it to form an understory with less tolerant species, cleaning their boles of branches, protecting the soil, and yet making a good development itself. It should occupy the same position in American silviculture that beech does in European.

RANGE AND OCCURRENCE.

Sugar maple ranges from southern Newfoundland southward to Georgia and western Florida, and westward to the Lake of the Woods and to eastern South Dakota, Nebraska, Kansas, and Texas. It is widely distributed throughout the eastern part of the United States, and is, in many sections, very abundant.

It thrives best at high altitudes in the southern part of its range and from moderate to high elevations in the northern part. Cool northerly slopes of hills and mountains offer ideal conditions for its development. It is most common and reaches its largest size in the following regions and localities: At moderately high elevations in New England; in the hilly or mountainous sections of New York and Pennsylvania; in the Ohio Valley; along the southern Appalachians, in coves and on northern slopes; and in the northern parts of the Lake States. In the lower lands, and toward the southern and western borders of its range, it is rare and individuals are smaller than under more favorable conditions. In South Dakota it is confined to ravines at the sources of streams; in the southern coastal plain it is of sporadic occurrence only; in Louisiana, Arkansas, and Mississippi it grows on upland flats and stream banks; and in Texas in hilly country along rivers.

CLIMATE.

A cool, moist climate is best suited to the requirements of sugar maple. The extremes of temperature within its range are −40° and 105° F. The mean annual precipitation varies from about 25 to 55 inches, and in the region of the tree's best development averages from 40 to 55 inches.

ASSOCIATED SPECIES.

The most constant associates of sugar maple throughout its range are beech, basswood, elms, ashes, hickories, and oaks. In cool situations in the northern part and at high altitudes in the southern part of its range it grows in mixture with red spruce, yellow birch, paper birch, and beech. White and black spruces and balsam fir occur as its associates in the North, but disappear in the South, where Fraser fir replaces balsam fir. Red maple, white pine, hemlock, yellow poplar, cucumber-tree, and buckeye are other associates. Sugar maple frequently forms a large part of virgin forests, and in the Lake States grows in pure stands over small areas. In New England many pure thickets of second-growth sugar maple are seen, and they are especially common on abandoned fields and pastures.

HABIT.

When grown in the open, sugar maple has a large, dense crown, and a short, thick bole; when forest grown, the crown, while still dense, becomes smaller, and the bole is clear for a greater length. It is a rather large tree, and at maturity averages from 70 to 80 feet in height, with a diameter of from 2 to 3 feet. Individuals on fertile soil occasionally reach 120 feet in height. Growth is slow, but fairly persistent. The root system is shallow and the tree is subject to windfall, so that heavy thinnings often result in blowdowns. The bark is usually ash gray, sometimes darker brown or blackish. The wood is hard, close-grained, and takes a fine polish. The occasional fancy grains, so highly prized in furniture, known as curly and bird's-eye maple, are abnormal growths of the wood; curly maple comes from a twisted growth of fiber, while bird's-eye maple frequently results from the development of dormant buds.

SOIL AND MOISTURE.

Sugar maple is exacting in its soil requirements, and needs a deep, moist soil of some fertility to enable it to make good development. In dry soil or exposed situations the growth is slow and the tree is stubby and irregular; in spite of its shallow root system it rarely does well in shallow soil.

TOLERANCE.

Next to beech, sugar maple is probably the most tolerant of American hardwoods. In youth, shade is an advantage, as seedlings under partial shade thrive much better than those in the open; but at maturity,

full light, while not essential, is not detrimental unless it dries out the soil too badly. Side shading is necessary to produce a clear bole, since the limbs are rather persistent.

SUSCEPTIBILITY TO INJURY.

Sugar maple is, in general, free from injuries, as it is fairly resistant to fire and is not seriously damaged by fungi. It is not very wind-firm, except when grown in the open. The principal damage to which it is subject is injury by the forest tent caterpillar, *Malacosoma disstria*, which often strips the foliage from sugar groves and materially reduces the vigor of the trees, although it seldom kills them outright unless its attacks are repeated year after year. Shade trees in towns are not infrequently injured by the maple borer, *Plagionotus speciosus*.

REPRODUCTION.

There is some production of seed almost every year, but full seed years occur only at intervals of from three to five years. The seeds, or keys, have rather a low germinating percentage, but the wings with which they are equipped insure wide dissemination by the wind, so that natural reproduction is good. The ability of the seedlings to remain vigorous under considerable shade enables a large proportion of those which start to survive, and makes reproduction doubly sure. The seeds germinate well on either humus or mineral soil, unless it is packed hard and dry. The tree has a fair sprouting capacity, and many second-growth stands contain thrifty trees which have developed from sprouts.

MANAGEMENT.

The management of sugar maple depends upon the object sought—a grove for the production of sugar, or a forest for the production of timber.

In sugar "bushes," or orchards, it is important to have vigorous, full-crowned trees. Thinnings should therefore begin early and should be fairly heavy, so that the trees may have full sunlight. Yet as many trees as possible should be left, consistent with the development of large crowns. In young, even-aged thickets it is a good plan to pick out the more thrifty, full-crowned trees which can be left to advantage, and to top off the rest. This frees the better trees from injurious competition, while the poorer ones which have been topped off will protect the soil, and can later be used as fuel for sap reduction. Promising young seedlings should not be cleared out, but should be left to take the place of the older trees when they die. Tapping may begin when the trees are 12 inches in diameter; not more than one spout per tree should be inserted, except in the case of very large and productive trees. The holes should be about 1 inch deep and three-eighths or one-half inch in diameter. Tapping, unless excessive, does not injure the tree, and can be continued indefinitely.

Where the tree is chiefly valuable for timber it is important to produce long, clear boles, instead of the full, vigorous crowns which are desirable in sugar trees. This demands an entirely different system of management, and the tree should be grown in closer stands, often as an understory beneath more rapid-growing species, or as a subordinate species in a selection forest.

In many regions sugar maple is now prominent in the forest, as a result of the extensive cutting of oak and other more important species. Owing to its tolerance the reproduction is usually good, and in typical culled forests in regions best suited to it the sugar maple commonly constitutes a larger proportion of the second growth than it did of the original forest. When it occurs in mixture with other more valuable species, such as white oak, ash, and walnut, as is sometimes the case in the central and southern parts of its range, the aim of management should be to favor these species and to keep the sugar maple in a subordinate position. In the northern part of its range, where its chief associates among the hardwoods are yellow birch and beech, it should be favored as against beech, but not against yellow birch. Its great tolerance and demand for a certain amount of protection in early youth, as well as the fact that it usually grows in mixed stands, point to the selection system as the best to use in its management.

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